whispers

9th Workshop on Hyperspectral Image and Signal Processing : Evolution in Remote Sensing

Workshop Program

23-26 September 2018, Amsterdam, The Netherlands

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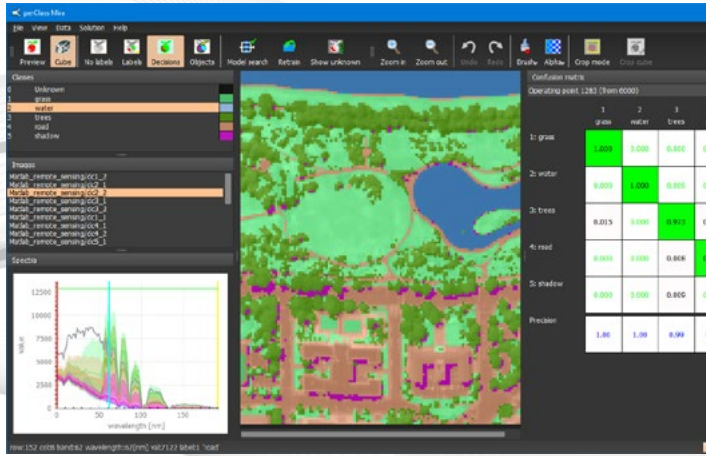
Making sense of spectral imaging



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Bing Zhang, *Institute of Remote Sensing & Digital Earth, China*
Xiaoxiang Zhu, *German Aerospace Center (DLR) and Technical University of Munich (TUM), Germany*

Multimedia

Vincent Couturier-Doux

Conference Venue

Amsterdam Conference Centre Beurs van Berlage
Damrak 243
1012 ZJ Amsterdam
The Netherlands

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info@beursvanberlage.com
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Arrival from Amsterdam Schiphol Airport

From Amsterdam Schiphol Airport, you can reach Amsterdam Conference Centre Beurs van Berlage by train or taxi. If you are travelling by train, you can buy a ticket to Amsterdam Centraal Station in the Arrivals Hall of Schiphol. The trains leave four times every hour and the journey takes about fifteen minutes. If you take a taxi, you can state "Beurs van Berlage" as your destination. The address is: Damrak 243. The drive takes about twenty-five minutes.

Arrival from Amsterdam Centraal Station

Beurs van Berlage is 300 metres away, about a five minute walk. You can see Beurs van Berlage on the Damrak in front of you when you leave the Central Station along the Stationsplein (Station square) and head out towards the Dam from there.

Tram	Stop : Dam (Bijenkorf)	Trams : 4, 9, 16, 24, 25	Walking : 1 minute
	Stop : Dam (Magnaplaza)	Trams : 10, 13, 14, 17	Walking : 5 minute
Bus	Stop : Dam (Bijenkorf)	Bus : 355, 357, 359, 361, 363	Walking : 1 minute
	Stop : Dam/Raadhuisstraat	Bus : 170, 170, 174, 272, 352, 354,358, N70	Walking : 5 minute

For an up-to-date timetable, go to www.gvb.nl

Taxi There are taxi stops right next to Beurs van Berlage, at the Oudebrugsteeg. You can order a cab at the Taxi Centrale Amsterdam, 020 - 777 77

Car The ideal way to reach the city centre of Amsterdam is to park your car at a P+R-location at the edge of the city, and use public transportation the rest of the way. If you come from the northeast, east or southeast of the Netherlands, it is best to use the P+R Zeeburg. Accessible via Ring A10, exit S114. If you come from the northwest or west of the Netherlands, it is best to park at P+R Sloterdijk. Accessible via Ring A10, exit S103.

Parking centrum Oosterdok
- Oosterdokstraat 150, 1011 DK Amsterdam
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- Beursplein 15, 1012 JW Amsterdam
- Immediately next to Beurs van Berlage
- 400 parking spaces
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- Opening hours 24 hours, 7 days a week
- For rates please check the website www.q-park.nl

Disabled access
Beurs van Berlage is largely accessible for disabled people. Unfortunately, Beurs van Berlage has no special disabled parking spaces. However, there is a Bijenkorf carpark right next to Beurs van Berlage. The Beurs van Berlage Toren (Tower) is only accessible by stairs.

Registration Desk

Sunday, 23 : from 9:00 to 18:00
Monday, 24 to Wednesday, 26 : from 8:00 to 18:00
Onsite registration : cash and credit card accepted

Internet

Free Wi-Fi is available in the whole building and its password will be provided on-site.

Speaker Preparation

Software: Each lecture hall is equipped with Office and Acrobat reader.

- File types: We accept .ppt, .pptx or .pdf formats.
- Loading your presentation: Please go to the appropriate lecture hall to upload your presentation BEFORE the start of your session. A Whisperer will be there to assist you as needed.

Poster Preparation

Set-up: Please arrive each day at the opening to set-up your poster. Whisperers will be there to assist you.

- Break-down: Please remove your poster at the end of the day, to free the spot for the next day's posters.
- Presentation: speaker should be alongside the poster during the coffee breaks.
- Size: max posters size is A0 (841 × 1189 mm).

IEEE (https://www.ieee.org)
IEEE and its members inspire a global community to innovate for a better tomorrow through highly cited publications, conferences, technology standards, and professional and educational activities. IEEE is the trusted "voice" for engineering, computing, and technology information around the globe.

IEEE - GRSS (http://www.grss-ieee.org)
The fields of interest of the IEEE Geoscience and Remote Sensing Society are the theory, concepts, and techniques of science and engineering as they apply to the remote sensing of the earth, oceans, atmosphere, and space, as well as the processing, interpretation and dissemination of this information.

DLR (https://www.dlr.de)
The German Aerospace Center (DLR) is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport, digitalisation and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project management agency.

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The Technical University of Munich (TUM) combines top-class facilities for cutting-edge research with unique learning opportunities for students. It is committed to finding solutions to the major challenges facing society as we move forward: Health & Nutrition • Energy & Natural Resources • Environment & Climate • Information & Communications • Mobility & Infrastructure. The university thinks and acts with an entrepreneurial spirit. Its aim: to create lasting value for society. All this combines to make it one of Europe's leading universities.

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The European Space Agency (ESA) is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. ESA is an international organisation with 22 Member States. By coordinating the financial and intellectual resources of its members, it can undertake programmes and activities far beyond the scope of any single European country.

Plenary 1 — Monitoring natural ecosystems using multi / hyperspectral imaging and physical modeling

sunday, 23

Jean-Baptiste Feret, *TETIS Joint Research Unit National Research, IRSTEA, Montpellier,France*

Abstract: Monitoring status and changes in function and composition of ecosystems is an important challenge: operational applications are awaited by ecologists and deciders in order to identify solutions against the accelerating erosion of biodiversity. Remote sensing is a critical source of information to build such monitoring system, and imaging spectroscopy proved its capacity for the estimation of biodiversity indices over various types of ecosystems, even highly heterogeneous and complex tropical forests. Multispectral satellite imagery such as Sentinel-2 data compensates less spectral information by high frequency of revisit and a capacity to perform regional mapping. Therefore an important work is needed in order to identify the potential of individual data sources as well as their synergies.

Physical modeling is particularly relevant tool to help understand the physical processes leading to information acquired with imaging spectroscopy: it can be used for the identification of key biophysical properties influencing the radiometric signal, and in order to improve existing methods, including generalization ability of data driven image processing algorithms using machine learning or statistical approaches. It can also play a role in the identification of the synergies among sensors, as well as the preparation of future satellite missions.

This presentation will introduce recent advances in physical modeling of vegetation, from leaf scale to canopy scale. It will discuss about possibilities to integrate lidar information and field spectroscopy in order to generate simulations of different types of images acquired over heterogeneous vegetated ecosystems, and perspectives for the exploitation of current data sources and the preparation of future missions.

Jean-Baptiste Féret obtained his degree in Agronomy Engineering from the International Center for Higher Education in Agricultural Sciences (Montpellier SupAgro, France) in 2005 and specialized in information and communication technologies applied to agriculture (AgroTIC). He worked on the characterization of soils properties in Mediterranean vineyards using hyperspectral remote sensing during his Master thesis. He specialized on physical modeling of vegetation during his PhD and obtained his Ph.D. degree in Environmental Sciences from Université Pierre et Marie Curie – Paris 6, France in 2009, entitled "Contribution of physical modeling for the estimation of leaf pigment content using remote sensing". He developed the latest versions of the PROSPECT leaf model since then: PROSPECT-5 and PROSPECT-D. He worked as post-doctoral researcher in Asner Lab (Department of Global Ecology, Carnegie Institution for Science, Stanford, CA) from 2010 to 2014 where he became project leader for biodiversity mapping for the Carnegie Airborne Observatory project. In 2014, he was funded by the French space agency (CNES) and worked at CESBIO (Toulouse, France), on the preparation of hyperspectral satellite missions. He particularly focused on applications related to the monitoring of tropical biodiversity with a combination of 3D radiative transfer models and image processing tools. He is affiliated with the National Research Institute of Science and Technology for Environment and Agriculture (Irstea) since 2014, and works at the TETIS joint research unit. His main research interests are focused on i) improving leaf scale modeling as well as the integration of multiple data sources (such as LiDAR & spectroscopy) into complex 3D canopy models (DART) in order to broaden their domain of application for heterogeneous canopies, and ii) developing methods combining physical modeling and machine learning for the monitoring of natural and monitored ecosystems based on their biophysical properties.

From Lab to Space and Back to Earth – DLR's Activities in Hyperspectral Remote Sensing

Plenary 2

Richard Bamler, *German Aerospace Center (DLR) and Technical University of Munich (TUM), Germany*

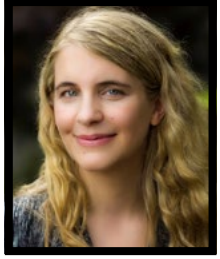
monday, 24

Abstract: This is a guided tour of DLR's research and development work in hyperspectral imaging. It starts at our laboratories, including the Calibration Home Base (for characterization of HS instruments), an underwater environment simulator (for absorption and fluorescence studies of cyanobacteria) and field spectrometers. One of the drivers of DLR's HIS activities are the missions DESIS, launched 29 June 2018, and EnMAP. The current status of the instruments and the ground segments will be presented and – most probably – first DESIS data will be shown.

During the last years a suite of HS analysis algorithms has been developed at DLR, from unmixing, denoising, de-clouding and sharpening to classification. They are based on sparsity and low-rank properties and/or employ deep learning, but may also be physics-based. A potpourri of representative results will be shown – from urban mapping through water remote sensing.

Finally, a large-area benchmark dataset for the fusion of multispectral and hyperspectral images taken by our HySpex and 3K sensors will be presented.

Richard Bamler (M'95–SM'00–F'05) received his Diploma degree in Electrical Engineering, his Doctorate in Engineering, and his "Habilitation" in the field of signal and systems theory in 1980, 1986, and 1988, respectively, from the Technical University of Munich, Germany.
He worked at the university from 1981 to 1989 on optical signal processing, holography, wave propagation, and tomography. He joined the German Aerospace Center (DLR), Oberpfaffenhofen, in 1989, where he is currently the Director of the Remote Sensing Technology Institute.
In early 1994, Richard Bamler was a visiting scientist at Jet Propulsion Laboratory (JPL) in preparation of the SIC-C/X-SAR missions, and in 1996 he was guest professor at the University of Innsbruck. Since 2003 he has held a full professorship in remote sensing technology at the Technical University of Munich as a double appointment with his DLR position. His teaching activities include university lectures and courses on signal processing, estimation theory, and SAR.
Since he joined DLR Richard Bamler, his team, and his institute have been working on SAR and optical remote sensing, image analysis and understanding, stereo reconstruction, computer vision, ocean color, passive and active atmospheric sounding, and laboratory spectrometry. They were and are responsible for the development of the operational processors for SIR-C/X-SAR, SRTM, TerraSAR-X, TanDEM-X, Tandem-L, ERS-2/GOME, ENVISAT/SCIAMACHY, MetOp/GOME-2, Sentinel-5P, Sentinel-4, DESIS, EnMAP, etc.
Richard Bamler's research interests are in algorithms for optimum information extraction from remote sensing data with emphasis on SAR. This involves new estimation algorithms, like sparse reconstruction, compressive sensing and deep learning.



Plenary 3 — Near Infrared Spectral Imaging: from the macro- to the micro-scale and beyond

tuesday, 25

Aoife Gowen, *UCD School of Biosystems and Food Engineering, Univ. College Dublin, Belfield, Dublin 4, Ireland*

Abstract: Spectral Imaging expands NIR spectroscopy into the spatial domain through acquisition of spatially contiguous spectra over a sample surface. This technique enables investigation of the spatial distribution of bio-chemical components on or within a sample. NIR spectral images can be obtained using different modalities, such as transmission, reflectance, transflectance or interactance, and at various spatial scales, with pixel sizes ranging in size from millimetres to microns. More recently, darkfield NIR spectral imaging has been developed for characterisation of NIR scattering spectra of nanometre sized objects, such as cells and nanoparticles. This flexibility has widened the scope for potential applications in the biosciences, for example food quality analysis, pharmaceutical quality control, agricultural analysis and tissue characterisation. Regardless of the application, many common challenges are shared by practitioners of this technique, such as instrument selection, sample presentation and data analysis. These challenges are illustrated here through the presentation of case studies from our laboratory, including: spatially registered macroscopic and microscopic characterisation of biomaterials; time series analysis of biopolymers to characterise their stability and interaction with water and darkfield NIR spectral imaging of tissue and cells to enhance knowledge of their microenvironment and response to various treatments.

Aoife Gowen is an Associate Professor in the UCD School of Biosystems and Food Engineering. Her research area is multidisciplinary, involving applications of spectral imaging and chemometrics to biological systems, including foods, microbes and biomaterials. After completing her undergraduate degree in Theoretical Physics (2000), she moved to a new discipline – the highly applied research area of Food Science. Her PhD thesis, completed in 2006, concerned mathematical modeling of food quality parameters and optimization of food process operations. During her time as a post-doctoral researcher (2007-2013) she investigated the intersection of near infrared spectroscopy, chemical imaging and chemometrics for characterization of biological systems. She has been successful in gaining funding awards to support her research activities, including a European Union Marie Curie International Outgoing Fellowship and a European Research Council (ERC) starting grant. Further information on her research group can be found here: http://www.ucd.ie/sirg

Linear and Nonlinear Hyperspectral Unmixing

Tutorial 1

Paul Gader, *University of Florida, USA*

sunday, 23

Abstract: This course will discuss many algorithms for hyperspectral unmixing with in--depth discussions of several representative techniques. The first part of the course will cover linear unmixing. Geometric and Optimization based algorithms will be described first and will be followed by presentation of signature library based algorithms. Probabilistic approaches will be covered in some depth with a focus on sparsity and representations of natural materials by probability distributions including Beta, Gaussian, and Gaussian Mixture Models. A comparison of signature library and probabilistic methods will discussed in terms of representing natural variability. Piecewise linear unmixing will then be covered and stand as a bridge between linear and nonlinear approaches. Model--driven and data driven approaches to nonlinear unmixing will be discussed and compared. Matlab code will be used to present live demos of many concepts and code will be available for many of the examples on github.

Paul Gader is a Professor and former Chair of Computer and Information Science and Engineering and an affiliate faculty member in Environmental Engineering Science at the University of Florida. His research has ranged from mathematics to operational algorithms beginning with the development of detection algorithms for FLIR imagery in 1984. He received a Ph.D. in Math in 1986 for parallelizing image processing algorithms. He has been a Senior Research Scientist at Honeywell's System & Research Center; Research Engineer & Manager at the Environmental Research Institute of Michigan; and has held faculty positions at the Universities of Wisconsin-- Oshkosh, Missouri; the University of Florida. He was a Visiting Professor at the Grenoble Institute of Technology in France and at the University of California – Santa Barbara, California. He has focused at applying theory to problems, often using multi--sensor processing. He is currently focusing on computational analysis for Imaging Spectroscopy (Hyperspectral Image Analysis).

He has been a leading researcher of algorithms for handwriting recognition and landmine detection. In the early 1990s, he led the development of a 5th ranked neural network handwritten character recognizer in a NIST competition and a top ranked handwritten word recognizer. He led teams that devised and implemented Hidden Markov Model and Possibilistic detectors in real--time on a Mine Detection System fielded in Afghanistan in 2008. The system is featured in a National Geographic Television program: "Bomb Hunters: Afghanistan".

He has been researching hyperspectral algorithms since 2002, first using LWIR hyperspectral; planning and conducting a VIS/NIR LiDAR airborne data collection and building a well--ground truthed collection; and engaging in a variety of research exercises in unmixing, dimensionality reduction, and classification using NASA and National Science Foundation big data sets. He is developing physics--based and data driven nonlinear computational models. He was general chair of the IEEE Workshop on Hyperspectral Image and Signal Processing in June 2013. Dr. Gader has published over 100 journal and over 300 total papers, served for three years as a UF Research Foundation Professor and was named an IEEE Fellow in 2011.

Tutorial 2 Model Based Hyperspectral Image Denoising

sunday, 23

Behnood Rasti, *Keilir Institute of Technology, Iceland*

Abstract: The received radiance at the hyperspectral sensor is degraded by sensor noises which include Johnson noise, quantization noise, and photon noise. These noises usually corrupt the spectral bands by varying degrees and degrade the efficiency of the hyperspectral image (HSI) analysis techniques. As a result, they are often discarded from the hyperspectral data before any further processing. Alternatively, hyperspectral denoising can be considered as a preprocessing step in HSI analysis to improve the signal to noise ratio and recover the corrupted bands. In this talk, I will first give an introduction about HSI denoising which includes HSI Modeling, HSI Denoising Criteria, HSI Noise Assumptions, and HSI Denoising Challenges. I will then give an overview on HSI denoising techniques categorized in four main groups including, 3D Model- Based and 3D Filtering Approaches, Spectral and Spatial-Spectral Penalty-Based Approaches, Low-Rank Modelbased Approaches, and Approaches Making the Mixed Noise Assumption. I will also show experimental results of a few HSI denoising method applied on simulated and real HSI datasets. Additionally, I will consider HSI denoising as a preprocessing step for HSI classification and will discuss the advantage of utilizing the denoising algorithms to improve the classification accuracies. Finally, I will give a summary on the evolution of HSI denoising and discuss the future challenges in HSI denoising. I will end my talk by introducing a Matlab toolbox on HSI denoising which has been recently provided online related to our recent review paper together with Paul Scheunders, Pedram Ghamisi, Giorgio Licciardi, and Jocelyn Chanussot entitled, "Noise Reduction in Hyperspectral Imagery: Overview and Application".

Behnood Rasti (S'12, M'14) received the B.Sc. and M.Sc. degrees in electrical and electronics engineering from the University of Guilan, Rasht, Iran, in 2006 and 2009, respectively, and the Ph.D. degree in electrical and computer engineering from the Department of Electrical and Computer Engineering, University of Iceland, Reykjavik, Iceland, in 2014.

From 2015 to 2016, he was a Post-Doctoral Researcher with the University of Iceland. In 2016, he joined the Keilir Institute of Technology (KIT), Reykjanesbaer, Iceland, where he is currently an Instructor. His research interests include signal and image processing, hyperspectral image analysis, remote sensing data fusion, biomedical engineering, biomedical data analysis, control system, and robotics.

Machine Learning/Deep Learning in Remote Sensing

Tutorial 3

sunday, 23

Xiaoxiang Zhu, *German Aerospace Center (DLR) and Technical University of Munich (TUM), Germany*
Ronny Hänsch, *Computer Vision and Remote Sensing, TU Berlin, Germany*

Abstract: Despite the wide and often successful application of machine learning techniques to analyse and interpret remotely sensed data, the complexity, special requirements, as well as selective applicability of these methods often hinders to use them to their full potential. The gap between sensor- and application-specific expertise on the one hand, and a deep insight and understanding of existing machine learning methods often leads to suboptimal results, unnecessary or even harmful optimizations, and biased evaluations. The aim of this tutorial is threefold: First, spread good practices for data preparation: Inform about common mistakes and how to avoid them (e.g. dataset bias, non-iid samples), provide recommendations about proper preprocessing and initialization (e.g. data normalization), and state available sources of data and benchmarks. Second, present efficient and advanced machine learning tools: Give an overview of standard machine learning techniques and when to use them (e.g. standard regression and classification techniques, clustering, etc.), as well as introducing the most modern methods, such as random fields, ensemble learning. Third, a particular focus will be put on deep learning. Central to the paradigm shift toward data-intensive science, deep learning has proven to be both a major breakthrough and an extremely powerful concept in many fields. The goal is to highlight what makes deep learning special in remote sensing, to showcase successful examples, to provide resources to make deep learning in remote sensing readily applicable, and more importantly, to discuss open issues.

Xiaoxiang Zhu is the Professor for Signal Processing in Earth Observation (SiPEO, www.sipeo.bgu.tum.de) at Technical University of Munich (TUM) and the German Aerospace Center (DLR), Germany. She is also the founding head of the department of EO Data Science in DLR's Earth Observation Center. Zhu received the Master (M.Sc.) degree, her doctor of engineering (Dr.-Ing.) degree and her "Habilitation" in the field of signal processing from TUM in 2008, 2011 and 2013, respectively. She was a guest scientist or visiting professor at the Italian National Research Council (CNR-IREA), Naples, Italy, Fudan University, Shanghai, China, the University of Tokyo, Tokyo, Japan and University of California, Los Angeles, United States in 2009, 2014, 2015 and 2016, respectively. Her main research interests are remote sensing and Earth observation, signal processing, machine learning and data science, with a special application focus on global urban mapping.

Ronny Hänsch received the Diploma degree in computer science and the Ph.D. degree from the Technische Universität Berlin, Berlin, Germany, in 2007 and 2014, respectively. His research interests include computer vision, machine learning, object detection, neural networks and Random Forests. He worked in the field of object detection and classification from remote sensing images, with a focus on polarimetric synthetic aperture radar images. His recent research interests focus on the development of probabilistic methods for 3D reconstruction by structure from motion as well as ensemble methods for image analysis.

Tutorial 4 DART tutorial

sunday, 23

Jean-Baptiste Feret, *TETIS Joint Research Unit National Research, IRSTEA, Montpellier,France*

Abstract: DART is a 3D radiative transfer model (http://www.cesbio.ups-tlse.fr/dart) allowing simulation of complex and heterogeneous landscapes acquired by different sensors, including imaging spectrometers and LiDAR. It is a useful tool to understand radiometric mechanisms involved when using remotely sensed information. The objective of this tutorial is to introduce recent developments dedicated to the utilization of DART in the case of simulation of imaging spectroscopy data, and it will be illustrated by study cases corresponding to forest ecosystems. Sensitivity studies will be explored through graphical user interface as well as dedicated python scripts.

Agenda
60 minutes: Overview of DART scientific related questions, including major radiometric terms used in optical remote sensing.
30 minutes: Interactive presentation of DART major functionalities and Graphic User Interface. From this stage, participants work with their laptops. DART is installed if needed.
45 minutes: Exercises about reflectance in the optical domain for 2D landscapes.
45 minutes: Creation of 3D mock-up.
Requirements : In order to make the tutorial more efficient, participants are advised
- to get a free DART license (www.cesbio.ups-tlse.fr/dart) before the training.
- to get an overview of the DART User Manual (www.cesbio.ups-tlse.fr/dart)
- to make a few exercises of work packages 1 and 2 of DART User Manual.
- to have basic knowledge of programming in Python

presented by Jean-Baptiste FERET (UMR TETIS, IRSTEA) & Florian de BOISSIEU (UMR TETIS, IRSTEA)

Jean-Baptiste Féret obtained his degree in Agronomy Engineering from the International Center for Higher Education in Agricultural Sciences (Montpellier SupAgro, France) in 2005 and specialized in information and communication technologies applied to agriculture (AgroTIC). He worked on the characterization of soils properties in Mediterranean vineyards using hyperspectral remote sensing during his Master thesis. He specialized on physical modeling of vegetation during his PhD and obtained his Ph.D. degree in Environmental Sciences from Université Pierre et Marie Curie – Paris 6, France in 2009, entitled "Contribution of physical modeling for the estimation of leaf pigment content using remote sensing". He developed the latest versions of the PROSPECT leaf model since then: PROSPECT-5 and PROSPECT-D. He worked as post-doctoral researcher in Asner Lab (Department of Global Ecology, Carnegie Institution for Science, Stanford, CA) from 2010 to 2014 where he became project leader for biodiversity mapping for the Carnegie Airborne Observatory project. In 2014, he was funded by the French space agency (CNES) and worked at CESBIO (Toulouse, France), on the preparation of hyperspectral satellite missions. He particularly focused on applications related to the monitoring of tropical biodiversity with a combination of 3D radiative transfer models and image processing tools. He is affiliated with the National Research Institute of Science and Technology for Environment and Agriculture (Irstea) since 2014, and works at the TETIS joint research unit. His main research interests are focused on i) improving leaf scale modeling as well as the integration of multiple data sources (such as LiDAR & spectroscopy) into complex 3D canopy models (DART) in order to broaden their domain of application for heterogeneous canopies, and ii) developing methods combining physical modeling and machine learning for the monitoring of natural and monitored ecosystems based on their biophysical properties.

WHISPERS at a glance

Sunday, 23

9:30 **Tutorials**

1 - Paul Gader

2 - Behnood Rasti

3 - Xiaoxiang Zhu & Ronny Hänsch

4 - Jean-Baptiste Feret

13:30

14:00 Opening Ceremony

14:30 **Plenary 1** — Jean-Baptiste Feret

15:30 Coffee Break

16:00 **sun-o-1-a** Deep Learning (1)

sun-o-1-b Calibration New Sensor

18:00

Monday, 24

All day poster session

8:30 **Plenary 2** — Richard Bamler

9:30 Coffee Break

10:00 **mon-o-1-a** DESIS / EnMAP (1)

mon-o-1-b Applications

12:00 Lunch

13:30 **mon-o-2-a** DESIS / EnMAP (2)

mon-o-2-b Urban

15:30 Coffee Break

16:00 **mon-o-3-a** Mineralogy

mon-o-3-b Superresolution/ Reconstruction

18:00

Tuesday, 25

All day poster session

8:30 **Plenary 3** — Aoife Gowen

9:30 Coffee Break

10:00 **tue-o-1-a** Anomaly and Target Detection

tue-o-1-b Precision Farming

12:00 Lunch

13:30 **tue-o-2-a** Multi-modality and Data Fusion

tue-o-2-b Hyper-spectral Imaging from Small Platforms (1)

tue-o-2-c Hyper-spectral sensing: end to end (1)

15:30 Coffee Break

16:00 **tue-o-3-a** Spectral Unmixing

tue-o-2-b Hyper-spectral Imaging from Small Platforms (2)

tue-o-3-c Hyper-spectral sensing: end to end (2)

18:00

Wednesday, 26

All day poster session

8:30 **wed-o-1-a** Retrieval of Water Parameters

wed-o-1-b Deep Learning (2)

10:30 Coffee Break

11:00 **Round Table**

12:00 Lunch

13:30 **wed-o-2-a** Thermal and Infrared Sensing

wed-o-2-b Multidate Sensing

15:30 Coffee Break

16:00 **wed-o-3-a** Classification

wed-o-3-b Gas and Trace Gases

18:00

Overview

9:00 Opening

9:30 Tutorials

Tutorial 1 9:30 - 13:30	**Linear and Nonlinear Hyperspectral Unmixing**	**Tutorial 2** 9:30 - 13:30	**Model Based Hyperspectral Image Denoising**
Tutorial 3 9:30 - 13:30	**Machine Learning/Deep Learning in Remote Sensing**	**Tutorial 4** 9:30 - 13:30	**DART tutorial**

13:30 End of tutorials

14:00 Opening Ceremony

14:30 Plenary 1

Monitoring natural ecosystems using multi / hyperspectral imaging and physical modeling
Jean-Baptiste Feret, *TETIS Joint Research Unit National Research, IRSTEA, Montpellier,France*

15:30 Coffee Break

16:00 Oral Sessions

	Room A		Room B
	sun-o-1-a	**Deep Learning (1)**	**sun-o-1-b**	**Calibration / New Sensor**

18:00 End of the day

Opening Ceremony — 14:00

Plenary 1 — Monitoring natural ecosystems using multi / hyperspectral imaging and physical modeling — 14:30 - 15:30

Jean-Baptiste Feret, *TETIS Joint Research Unit National Research, IRSTEA, Montpellier,France*
Session chair : **Jon Atli Benediktsson, University of Iceland, Iceland**

Coffee break — 15:30

sun-o-1-a Deep Learning (1) — 16:00 - 18:00

Session chairs : **Paul Scheunders**, *University of Antwerp, Belgium*
Xiaoxiang Zhu, *DLR / TUM, Germany*

TREE SPECIES IDENTIFICATION USING 3D SPECTRAL DATA AND 3D CONVOLUTIONAL NEURAL NETWORK
Ilkka Pölönen, Leevi Annala, Samuli Rahkonen, Olli Nevalainen, Eija Honkavaara, Sakari Tuominen, Niko Viljanen and Teemu Hakala

ANALYSIS OF CAPSULENETS TOWARDS HYPERSPECTRAL CLASSIFICATION
Arun Pv, Krishna Mohan Buddhiraju and Alok Porwal

LEARNING A RECURRENT CONVOLUTIONAL NEURAL NETWORK FOR LAND COVER CHANGE DETECTION IN MULTISPECTRAL IMAGERY
Lichao Mou and Xiaoxiang Zhu

HYPERSPECTRAL SNAPSHOT IMAGING VIA DEEP LEARNING
Yongqiang Zhao, Jonathan Cheung-Wai Chan and Miaomiao Wang

SINGLE SENSOR IMAGE FUSION USING A DEEP CONVOLUTIONAL GENERATIVE ADVERSARIAL NETWORK
Frosti Palsson, Johannes R. Sveinsson and Magnus O. Ulfarsson

SINGLE SENSOR IMAGE FUSION USING A DEEP RESIDUAL NETWORK
Frosti Palsson, Johannes R. Sveinsson and Magnus O. Ulfarsson

sun-o-1-b Calibration / New Sensor — 16:00 - 18:00

Session chairs : **Torbjorn Skauli**, *Norwegian Defence Res. Est. (FFI), Norway*
Julio Hernandez, *HySpex, Norway*

DEVELOPMENT OF A MULTISPECTRAL LIDAR WITH AGILE WAVELENGTH SELECTION HARDWARE USING SUPERCONTINUUM LASER AS A LIGHT SOURCE
Tariq Ahmido, Thomas Ruekgauer, Joe Duperre and Joshua Broadwater

SPECTRAL CALIBRATION FOR CLOSE-RANGE HYPERSPECTRAL IMAGES
Wenzhi Liao, Daniel Erick Ochoa Donoso, Rodrigo Fabricio Castro Reyes, Ronald Criollo and Wilfried Philips

A STUDY ON OPTIMAL STRATEGY IN RELATIVE RADIOMETRIC CALIBRATION FOR HYPERSPECTRAL SENSORS
Kai Yu

FLEX LEVEL 2 STUDY: RE-CALIBRATION AND CROSS-CALIBRATION OF FLORIS AND S3-OLCI&SLSTR
Rosario Ruiloba, Jorge Vicent, Gwennael Matot, Emmanuel Hillairet, Béatrice Berthelot, Cindy Lemahieu, Matthias Drusch and Christine Fernandez-Martin

UNCERTAINTY ANALYSIS FOR SURFACE REFLECTANCE RETRIEVED FROM HYPERSPECTRAL REMOTE SENSING IMAGE USING EMPIRICAL LINE METHOD
Guorui Jia, Qian Xue and Huijie Zhao

RADIOMETRIC CALIBRATION OF A UAV-MOUNTED HYPERSPECTRAL SNAPSHOT CAMERA WITH FOCUS ON UNIFORM SPECTRAL SAMPLING
Jens Kern, Andreas Schenk and Stefan Hinz

Overview

All day **Poster sessions**

		mon-p-1	**Mineralogy**	**mon-p-2**	**Multimodality and Data Fusion**
		mon-p-3	**Software / Hardware**	**mon-p-4**	**Classification**
8:00	Opening				
8:30	**Plenary 2**				
		Hyperspectral Imaging from Space: DESIS, EnMAP, and Beyond **Richard Bamler,** *TU Munich, Germany*			
9:30	Coffee Break				
10:00	**Oral Sessions**	**Room A**		**Room B**	
		mon-o-1-a	**DESIS / EnMAP (1)**	**mon-o-1-b**	**Applications**
12:00	Lunch				
13:30	**Oral Sessions**	**Room A**		**Room B**	
		mon-o-2-a	**DESIS / EnMAP (2)**	**mon-o-2-b**	**Urban**
15:30	Coffee Break				
16:00	**Oral Sessions**	**Room A**		**Room B**	
		mon-o-3-a	**Mineralogy**	**mon-o-3-b**	**Superresolution / Reconstruction**
18:00	End of the day				

mon-p-1 Mineralogy

All day poster session

LASER-INDUCED FLUORESCENCE MAPPING: A NEW SPECTROSCOPIC TECHNIQUE FOR DETECTION OF RARE EARTH ELEMENTS IN ROCK SAMPLES
Peter Seidel, Sandra Lorenz, Suchinder Sharma, Margret Fuchs, Jan Beyer, Johannes Heitmann and Richard Gloaguen

MAPPING HYDROTHERMAL ALTERATION MINERAL ASSEMBLAGES IN TUPPADUR-BUDDINNI BLOCK OF HUTTI-MASKI SCHIST BELT USING AIRBORNE HYPERSPECTRAL DATA
Aravind Bharathvaj, Kusuma K N, Lakshmi Ram Prasath H and Chaitanya Sandaka

MULTI-SOURCE HYPERSPECTRAL IMAGING OF CARBONATITE-HOSTED REE-NB-TA MINERALIZATION AT MARINKAS QUELLEN, NAMIBIA
René Booysen, Robert Zimmermann, Sandra Lorenz, Richard Gloaguen and Paul Nex

EFFICACY OF HYPER-CORE-LOGGING IN URANIUM EXPLORATION: AN INVESTIGATION FROM KALADGI PROSPECT, INDIA
Kalimuthu Rajendran, Ramakrishnan Desikan and Hari Shankar Pandalai

MAPPING THE VARIATION IN CHLORITE CHEMISTRY FOR LOCATING AURIFEROUS LODES IN THE BUDDINNI TUPPADUR REGION OF HUTTI-MASKI SCHIST BELT, INDIA
Kusuma K N, Aravind Bharathvaj S and Lakshmi Ram Prasath H

RELATIVE AGE DATING OF HAWAIIAN LAVA FLOWS WITH AVIRIS AND HYTES HYPERSPECTRAL DATA
Michael Abrams

mon-p-2 Multimodality and Data Fusion

All day poster session

LEARNING A COMMON SUBSPACE FROM HYPERSPECTRAL-MULTISPECTRAL CORRESPONDENCES
Danfeng Hong, Naoto Yokoya, Xiao Xiang Zhu and Jocelyn Chanussot

IMPROVING COREGISTRATION OF MULTIDATE AND MULTISENSOR ORCHARD IMAGERY
Stefan Livens, Stephanie Delalieux, Laurent Tits and Yasmin Vanbrabant

MULTISPECTRAL LIDAR DATA FUSION VIA MULTIPLE KERNEL LEARNING FOR REMOTE SENSING CLASSIFICATION
Yukun Wang and Yanfeng Gu

JOINT TENSOR SUBSPACE ALIGNMENT ON MULTI-ANGULAR REMOTE SENSING IMAGE
Tianshuai Li and Yanfeng Gu

AN ALGORITHM OF REMOTELY SENSED HYPERSPECTRAL IMAGE FUSION
Xuejian Sun, Lifu Zhang and Yi Cen

LASER-INDUCED FLUORESCENCE AND HYPERSPECTRAL IMAGING INTEGRATED IN ONE SENSOR SYSTEM - THE INSPECTOR PROJECT
Margret Fuchs, Sandra Lorenz, Jan Beyer, Peter Seidel, Suchinder K. Sharma, Johannes Heitmann and Richard Gloaguen

DON'T SETTLE FOR ANYTHING LESS: EXCELLENCY IN RESOLUTION, POSITION AND SIGNAL QUALITY IN COMBINED HYPERSPECTRAL IMAGERY AND LIDAR USING STATE-OF THE ART EQUIPMENT AND ADVANCED GEOREFERENCING TECHNIQUES
Dagrun Aarsten and Vetle O. Jonassen

HYPERSPECTRAL AND LIDAR FUSION USING DEEP THREE-STREAM CONVOLUTIONAL NEURAL NETWORKS
Hao Li, Pedram Ghamisi, Uwe Soergel and Xiao Xiang Zhu

IMAGE FUSION BASED ON GRADIENT REGULARIZED CONVOLUTION SPARSE REPRESENTION
Jian Wang, Ping Ren, Ke Yang, Chunxia Qin and Xiufei Zhang

IMAGE FUSION FOR HYPERSPECTRAL IMAGE SUPER-RESOLUTION
Hasan Irmak, Gozde Bozdagi Akar and Seniha Esen Yuksel

TREE SPECIES CLASSIFICATION BY FUSING OF VERY HIGHRESOLTUION HYPERSPECTRAL IMAGES AND 3K-DSM
Xiangtian Yuan, Jiaojiao Tian, Daniela Cerra, Oliver Meynberg, Christian Kempf and Peter Reinartz

GRAPH REGULARIZED L1/2-SPARSITY CONSTRAINED NON-NEGATIVE MATRIX FACTORIZATION FOR HYPERSPECTRAL AND MULTISPECTRAL IMAGE FUSION
Sevcan Kahraman, Alp Ertürk and Sarp Ertürk

mon-p-3 Software / Hardware

All day poster session

AMIGO: A TOOL FOR THE GENERATION OF SYNTHETIC HYPERSPECTRAL IMAGES
Blanca Priego and Richard Duro

A HARDWARE-FRIENDLY ALGORITHM FOR THE ON-BOARD COMPRESSION OF HYPERSPECTRAL IMAGES
Raúl Guerra, María Díaz, Yubal Barrios, Sebastián López and Roberto Sarmiento

ASSESSMENT OF THE RADIOMETRIC ACCURACY IN A TARGETLESS WORKFLOW USING PIX4D SOFTWARE
Manuel Cubero-Castan, Klaus Schneider-Zapp, Massimiliano Bellomo, Dai Shi, Martin Rehak and Christoph Strecha

HARDWARE IMPLEMENTATION OF THE CCSDS 123.0-B-1 LOSSLESS MULTISPECTRAL AND HYPERSPECTRAL IMAGE COMPRESSION STANDARD BY MEANS OF HIGH LEVEL SYNTHESIS TOOLS
Yubal Barrios, Antonio Sánchez, Lucana Santos, José Fco. López and Roberto Sarmiento

mon-p-4 Classification

All day poster session

CAPSULE NETWORK IN HYPERSPECTRAL CLASSIFICATION
Gheorghe Gardu

TWO-LEVEL FEATURE EXTRACTION FRAMEWORK FOR HYPERSPECTRAL IMAGE CLASSIFICATION
Munmun Baisantry, Anil Sao and Dericks Shukla

RANDOMIZED NON NEGATIVE MATRIX FACTORIZATION FOR HYPERSPECTRAL IMAGE CLASSIFICATION
Vineetha Menon and Qian Du

A K-MEANS-GRAVITY-BASED CLUSTERING APPROACH FOR TERRAIN HYPERSPECTRAL IMAGERY
Hairong Tang and Xiurui Geng

COMPOSITE KERNEL CLASSIFICATION USING SPECTRAL-SPATIAL FEATURES AND ABUNDANCE INFORMATION OF HYPERSPECTRAL IMAGE
Yanli Sun and Xia Zhang

COMBINING CONTEXTUAL INFORMATION FOR SUBSPACE BASED HYPERSPECTRAL IMAGE CLASSIFICATION
Shuyuan Xu and Jun Li

ITERATIVE ACTIVE LEARNING WITH DIFFUSION GEOMETRY FOR HYPERSPECTRAL IMAGES
James Murphy and Mauro Maggioni

RESEARCH AND APPLICATION OF SPARSE REPRESENTATION CLASSIFICATION OF REMOTE SENSING IMAGERY BASED ON MULTI-FEATURE MODELING
Liu Yaoyao, Zhang Chunmei and Yang Kai

Opening of the conference 8:00

Plenary 2 Hyperspectral Imaging from Space: DESIS, EnMAP, and Beyond 8:30 - 9:30

Richard Bamler, *TU Munich, Germany*
Session chair : **Xiaoxiang Zhu,** *German Aerospace Center (DLR) and Technical University of Munich (TUM), Germany*

Coffee break 9:30

mon-o-1-a DESIS / EnMAP (1) 10:00 - 12:00

Session chairs : **Uta Heiden**, *DLR / TUM, Germany*
Rupert Müller, *DLR / TUM, Germany*

OVERVIEW AND STATUS OF THE DESIS MISSION
Rupert Müller, Kevin Alonso, Emiliano Carmona, Harald Krawcyk, Martin Bachmann, Daniele Cerra, David Krutz, Daniele Dietrich, Birgit Gerasch, Valentin Ziel, Uta Heiden and Raquel de Los Reyes

THE IMAGING SPECTROSCOPY MISSION ENMAP - ITS STATUS AND EXPECTED PRODUCTS
Tobias Storch, Hans-Peter Honold, Luis Guanter, Peter Schwind, Martin Muecke, Karl Segl and Sebastian Fischer

ENMAP GROUND SEGMENT INTEGRATION AND TECHNICAL VERIFICATION: DESIGN AND CURRENT STATUS
Martin Habermeyer, Emiliano Carmona, Sabine Engelbrecht, Klaus-Dieter Missling, Helmut Mühle, Andreas Ohndorf, Gintautas Palubinskas, Tobias Storch and Steffen Zimmermann

RADIOMETRIC AND SPECTRAL ONBOARD CALIBRATION CONCEPTS OF HYPERSPECTRAL SENSORS - SPECIFICS OF ENMAP AND DESIS
Harald Krawczyk, Kevin Alonso, Emiliano Carmona, Birgit Gerasch, Rupert Müller, David Krutz, Ilse Sebastian and Burghardt Günther

PROCEDURES FOR DATAQC WITHIN THE ENMAP AND DESIS GROUND SEGMENTS
Valentin Ziel, Kevin Alonso, Martin Bachmann, Emiliano Carmona, Daniele Cerra, Raquel de Los Reyes, Birgit Gerasch, Martin Habermeyer, Harald Krawczyk, Maximilian Langheinrich, Rupert Mueller, Gintautas Palubinskas, Miguel Pato, Mathias Schneider, Peter Schwind and Tobias Storch

SPECIFIC DATA CORRECTION FOR ENMAP AND DESIS
Kevin Alonso, Maximilian Langheinrich, Emiliano Carmona and Rupert Müller

mon-o-1-b Applications 10:00 - 12:00

Session chairs : **Richard Duro**, *Universidade da Coruna, Spain*
Manuel Cubero-Castan, *Pix4D, Switzerland*

BLOOD TRACE DETECTION IN CRIME SCENES USING A HYPERSPECTRAL CAMERA BASED ON A LINEAR VARIABLE FILTER
Maria Axelsson, Mikael Lundberg, Staffan Rattfält, David Gustafsson, Henrik Petersson and David Bergström

IN VIVO FISH DIET DISCRIMINATION USING SELECTED HYPERSPECTRAL IMAGE CLASSIFICATION METHODS
Mohammadmehdi Saberioon, Petr Císař and Laurent Labbé

SNAPSHOT MULTISPECTRAL AND HYPERSPECTRAL DATA PROCESSING FOR ESTIMATING FOOD QUALITY PARAMETERS
Christos Platias, Zacharias Kandylakis, Efstathios Panagou, George-John Nychas and Konstantinos Karantzalos

RECONSTRUCTION OF PARTIALLY SAMPLED EELS IMAGES
Etienne Monier, Thomas Oberlin, Nathalie Brun, Marta De Frutos, Marcel Tencé and Nicolas Dobigeon

APPLICATION OF HYBRID SWITCH METHOD TO QUANTIFY OIL SPILLS
Asmau Ahmed, Olga Duran, Yahya Zweiri and Mike Smith

MAPPING MANGROVE SPECIES USING HYPERSPECTRAL DATA: A CASE STUDY OF PICHAVARAM MANGROVE ECOSYSTEM, TAMIL NADU
Salghuna N N and Rama Chandra Prasad P

Lunch 12:00

mon-o-2-a DESIS / EnMAP (2) 13:30 - 15:50

Session chairs : **Rupert Müller**, *DLR / TUM, Germany*
Uta Heiden, *DLR / TUM, Germany*

ATMOSPHERIC CORRECTION IN DESIS AND ENMAP PROCESSING CHAINS - AN OVERVIEW
Raquel De Los Reyes, Maximilian Langheinrich, Rudolf Richter and Peter Schwind

GYPSUM ESTIMATION IN THE VNIR-SWIR SPECTRAL RANGE USING LABORATORY, AIR- AND SPACEBORNE HYPERSPECTRAL SENSORS FOR THE CHARACTERISATION OF SALT PAN ENVIRONMENTS
Robert Milewski, Sabine Chabrillat, Maximilian Brell and Luis Guanter

SPECTRAL ENHANCEMENT OF MULTISPECTRAL IMAGERY USING PARTIALLY OVERLAPPED HYPERSPECTRAL DATA AND SPARSE SIGNAL REPRESENTATION
Naoto Yokoya, Uta Heiden and Martin Bachmann

SENSITIVITY STUDY FOR AQUATIC ECOSYSTEM MONITORING WITH THE DESIS HYPERSPECTRAL SENSOR
Nicole Pinnel, Peter Gege and Anna Göritz

URBAN SURFACE MATERIAL COMPOSITION IN 30 M HYPERSPECTRAL REMOTE SENSING DATA
Marianne Jilge, Hannes Feilhauer, Uta Heiden, Carsten Neumann and Carsten Jürgens

DEVELOPING AN AUTOMATED PROCESSING CHAIN TO QUANTIFY SOIL, GREEN AND DRY VEGETATION IN SPACEBORNE IMAGING SPECTROSCOPY DATA
Martin Bachmann and Valentin Ziel

SPARSE IMAGE FUSION OF SENTINEL-2 AND ENMAP
Claas Grohnfeldt and Xiao Xiang Zhu

please notice end of session tue-o-2-a is 15:50

mon-o-2-b Urban 13:30 - 15:30

Session chairs : **Yannick Deville**, *IRAP, Toulouse, France*
Rahim Aguejad, *TETIS, Montpellier, France*

OBJECT-ORIENTED CLASSIFICATION OF URBAN LAND COVER USING HYPERSPECTRAL AND LIDAR REMOTE SENSING DATA
Rahim Aguejdad, Grzegorz Skupinski, Christiane Weber and Aziz Serradj

LINEAR-QUADRATIC NMF-BASED URBAN HYPERSPECTRAL DATA UNMIXING WITH SOME KNOWN ENDMEMBERS
Fatima Zohra Benhalouche, Moussa Sofiane Karoui and Yannick Deville

AIRBORNE IMAGING SPECTROSCOPY FOR ASSESSING SOIL SEALING EFFECT ON URBAN TREE HEALTH
Kang Yu, Jeroen Degerickx, Maarten Van Geel, Olivier Honnay and Ben Somers

URBAN VEGETATION MAPPING BY AIRBORNE HYPERSPETRAL IMAGERY; FEASABILITY AND LIMITATIONS
Walid Ouerghemmi, Sébastien Gadal, Gintautas Mozgeris and Donatas Jonikavičius

INVESTIGATION OF SPECTRAL ASSIGNMENTS FROM AIRBORNE HRS SENSOR TO MODEL FRICTION DETERIORATION IN ASPHALTIC ROADS
Nimrod Carmon, Eyal Ben-Dor and Csaba Lenart

Coffee break 15:30

mon-o-3-a Mineralogy 16:00 - 18:00

Session chairs : **Richard Gloaguen**, *HZDR, Germany*
Sabine Chabrillat, *GFZ, Potsdam, Germany*

THERMAL INFRARED HYPERSPECTRAL IMAGING FOR MINERALOGY MAPPING OF GEOLOGICAL OUTCROPS
Stephane Boubanga Tombet, Alexandrine Huot, Frédérick Marcotte and Martin Chamberland

AIRBORNE HYPERSPECTRAL LONGWAVE INFRARED QUANTIFICATION OF QUARTZ CONTENT COVERED BY BIOLOGICAL SOIL CRUSTS
Shahar Weksler, Eyal Ben Dor and Offer Rozenstein

RADIOMETRIC CORRECTION AND 3D INTEGRATION OF LONG-RANGE GROUND-BASED HYPERSPECTRAL IMAGERY FOR MINERAL EXPLORATION OF VERTICAL OUTCROPS
Sandra Lorenz, Sara Salehi, Moritz Kirsch, Robert Zimmermann, Gabriel Unger, Erik Vest Sørensen and Richard Gloaguen

A MACHINE LEARNING TECHNIQUE FOR DRILL CORE HYPERSPECTRAL DATA ANALYSIS
Cecilia Contreras, Mahdi Khodadadzadeh, Laura Tusa and Richard Gloaguen

EXPLORING ROCK PHOSPHATES USING HYPERSPECTRAL REMOTE SENSING & FIELD SPECTROSCOPY
Ramakrishnan Desikan and Kalimuthu Rajendran

mon-o-3-b Superresolution / reconstruction 16:00 - 18:00

Session chairs : **Zebin Wu**, *Nanjing Univ. of Science and Technology, China*
Kerry Cawse-Nicholson, *Jet Propulsion Lab., NASA, USA*

HYPERSPECTRAL IMAGE SUPER-RESOLUTION WITH SPECTRAL-SPATIAL NETWORK
Jinrang Jia, Luyan Ji, Yongchao Zhao and Xiurui Geng

SCALABLE LOW DIMENSIONAL MANIFOLD MODEL IN THE RECONSTRUCTION OF NOISY AND INCOMPLETE HYPERSPECTRAL IMAGES
Wei Zhu, Zuoqiang Shi and Stanley Osher

SPECTRAL CUBE RECONSTRUCTION FOR A HIGH RESOLUTION HYPERSPECTRAL CAMERA BASED ON A LINEAR VARIABLE FILTER
David Gustafsson, Henrik Petersson, Maria Axelsson and David Bergström

DICTIONARY BASED HYPERSPECTRAL IMAGE RECONSTRUCTION CAPTURED WITH CS-MUSI
Yaniv Oiknine, Boaz Arad, Isaac August, Ohad Ben-Shahar and Adrian Stern

FAST HYPERSPECTRAL CUBE RECONSTRUCTION FOR A DOUBLE DISPERSER IMAGER
Ibrahim Ardi, Hervé Carfantan, Antoine Monmayrant and Simon Lacroix

SUPER-RESOLUTION CLASSIFICATION OF HYPERSPECTRAL IMAGES WITH A SMALL TRAINING SET USING SEMI-SUPERVISED LEARNING
Yifan Zhang, Duanguang Zhang and Ting Wang

Overview

All day	**Poster sessions**				
		tue-p-1	**Vegetation / Forestry / Soil**	**tue-p-2**	**Unmixing and Classification**
		tue-p-3	**Anomaly and Target Detection**		
8:00	Opening				
8:30	**Plenary 3**				
		Near Infrared Spectral Imaging: from the macro- to the micro-scale and beyond **Aoife Gowen,** *University College Dublin, Ireland*			
9:30	Coffee Break				
10:00	**Oral Sessions**	**Room A**		**Room B**	
		tue-o-1-a	**Anomaly and Target Detection**	**tue-o-1-b**	**Precision Farming**
12:00	Lunch				
13:30	**Oral Sessions**	**Room A**		**Room B**	
		tue-o-2-a	**Multimodality and Data Fusion**	**tue-o-2-b**	**Hyperspectral Imaging from Small Platforms (1)**
		Room C			
		tue-o-2-c	**Hyperspectral sensing: end to end (1)**		
15:30	Coffee Break				
16:00	**Oral Sessions**	**Room A**		**Room B**	
		tue-o-3-a	**Spectral Unmixing**	**tue-o-3-b**	**Hyperspectral Imaging from Small Platforms (2)**
		Room C			
		tue-o-3-c	**Hyperspectral sensing: end to end (2)**		
18:00	End of the day				

tue-p-1 Vegetation / Forestry / Soil

All day poster session

A COMPARISON BETWEEN SENTINEL 2 AND AIRBORNE HYPERSPECTRAL DATA FOR SOIL ORGANIC CARBON PREDICTION IN CROPLANDS
Fabio Castaldi, Sabine Chabrillat, Kathrin Ward and Bas van Wesemael

MAPPING CROP VARIABILITY RELATED TO SOIL QUALITY AND CROP STRESS WITHIN RAINFED ME DITERRANEAN AGROECOSYSTEMS USING HYPERSPECTRAL DATA
Sabine Chabrillat, Thomas Schmid, Robert Milewski, Paula Escribano, Monica Garcia, Eyal Ben-Dor, Stephane Guillaso, Marta Pelayo, Andres Reyes, Veronica Sobejano-Paz and Marcos Jiménez Michavila

PLANT FUNCTIONAL TYPES VS. OPTICAL TYPES: DO SPECTRAL CLUSTERS OF HERBACEOUS SPECIES CAPTURE FUNCTIONAL TRAIT VARIATION ?
Elisa Van Cleemput, Hannes Feilhauer, Kenny Helsen, Olivier Honnay and Ben Somers

A REAL-WORLD HYPERSPECTRAL IMAGE PROCESSING PIPELINE FOR VEGETATION AND HYDROCARBON CHARACTERIZATION
Nicolas Audebert, Alexandre Alakian, Véronique Achard, Philippe Déliot, Sophie Fabre, Bertrand Le Saux, Anthony Crédoz, Dominique Dubucq, Cédric Taillandier and Sébastien Lefèvre

CLUSTERING FOREST TYPES BY MEANS OF REMOTELY-SENSED PHENOLOGY: ITALY AS A CASE STUDY
Sofia Bajocco, Carlotta Ferrara, Alessandro Alivernini, Marco Bascietto and Carlo Ricotta

NORMAL DIRECTION AND TRUE COLOR ESTIMATION OF LEAVES BASED ON TENSOR DECOMPOSITION OF LEAF-SCALE OPTICAL IMAGES
Kuniaki Uto, Mauro Dalla Mura and Jocelyn Chanussot

FUSION OF HYPERSPECTRAL IMAGES AND LIDAR DATA FOR FORESTRY MONITORING - A REVIEW
Eduardo Tusa, Anthony Laybros, Jean-Matthieu Monnet, Mauro Dalla Mura, Jean-Baptiste Barré, Michele Dalponte, Jean-Baptiste Féret, Grégoire Vincent and Jocelyn Chanussot

TRACKING HEATWAVE EFFECTS ON VEGETATION PRODUCTIVITY USING SOLAR-INDUCED CHLOROPHYLL FLUORESCENCE
Lifu Zhang, Na Qiao, Changping Huang and Siheng Wang

A SEMI-SUPERVISED ALGORITHM TO MAP MAJOR VEGETATION ZONES USING SATELLITE HYPERSPECTRAL DATA
Mevan Ekanayake, Hasantha Ekanayake, Anusha Rathnayake, Sajani Vithana, Vijitha Herath, Roshan Godaliyadda and Parakrama Ekanayake

BANDS SELECTION BASED ON GENETIC ALGORITHM FOR SPECIES VEGETATION DISCRIMINATION
Abdelilah El Amraoui, Abbass Rammal, Eric Perrin and Valeriu Vrabie

OPTIMIZED PROCESSING OF AIRBORNE HYPERSPECTRAL DATA FOR FOREST STUDIES
Stefanie Holzwarth, Nicole Pinnel, Martin Bachmann, Mathias Schneider, Claas Köhler, Andreas Baumgartner and Daniel Schläpfer

DISCRIMINATION OF TREE SPECIES BASED ON THEIR SPECTRA COLLECTED AT SPATIO-TEMPORAL SCALE IN THE FOREST OF ARAKU, EASTERN GHATS, INDIA.
Salghuna N N, Rama Chandra Prasad P and Rama Rao N

DEVELOPMENT OF HARMONIZED SOIL SPECTRAL LIBRARIES: ASSESSMENT OF THE INFLUENCE OF DIFFERENT LABORATORY SET-UPS AND HUMIDITY CONDITIONS
Sabine Chabrillat, Asa Gholizadeh, Carsten Neumann, Daniel Berger, Robert Milewski, Yaron Ogen and Eyal Ben Dor

USING MULTI-DIMENSIONAL DATASET (MDD) FOR APPLICATION OF REMOTE SENSING TIME SERIES: A CASE STUDY IN FOREST DISTURBANCES
Lifu Zhang, Yukun Lin and Nan Wang

tue-p-2 Unmixing and Classification

All day poster session

SPECTRAL UNMIXING WITH SPARSITY AND STRUCTURING CONSTRAINTS
Ramzi Ben Mhenni, Sebastien Bourguignon, Jordan Ninin and Frédéric Schmidt

RECURSIVE ORTHOGONAL VECTOR PROJECTION FOR HYPERSPECTRAL IMAGE ABUNDANCE ESTIMATION BASED ON GPU
Chunyan Yu, Jin Huang, Meiping Song, Dong An and Chein-I Chang

ALGORITHM RESEARC ON ENDMEMBER EXTRACTION COMBINED WITH DISTRIBUTION STATISTICS
Meiping Song, Ming Xu and Chein-I Chang

A SEMANTIC FEATURE EXTRACTION METHOD FOR HYPERSPECTRAL IMAGE CLASSIFICATION BASED ON HASHING LEARNING
Meng Zhao, Chunyan Yu, Meiping Song and Chein-I Chang

PARAMETER ESTIMATION FOR BLIND LQ HYPERSPECTRAL UNMIXING USING BAYESIAN OPTIMIZATION
Jakob Sigurdsson, Magnus Ulfarsson and Johannes Sveinsson

BILINEAR MATRIX FACTORIZATION USING A GRADIENT METHOD FOR UNMIXING HYPERSPECTRAL IMAGES COMBINED WITH MULTISPECTRAL DATA
Yasmine Kheira Benkouider, Fatima Zohra Benhalouche, Moussa Sofiane Karoui, Yannick Deville and Shahram Hosseini

VOLUME REGULARIZED NON-NEGATIVE MATRIX FACTORIZATIONS
Andersen M.S. Ang and Nicolas Gillis

CLASSIFICATION USING UNMIXING MODELS IN AREAS WITH SUBSTANTIAL ENDMEMBER VARIABILITY
Edurne Ibarrola-Ulzurrun, Lucas Drumetz, Jocelyn Chanussot, Javier Marcello and Consuelo Gonzalo-Martín

A MULTITEMPORAL LINEAR SPECTRAL UNMIXING: AN ITERATIVE APPROACH ACCOUNTING FOR ABUNDANCE VARIATIONS
Jignesh Bhatt, Manjunath Joshi and Vijayashekhar S.S.

tue-p-3 Anomaly and Target Detection

All day poster session

HYPERSPECTRAL ANOMALY DETECTION USING COLLABORATIVE REPRESENTATION WITH PCA REMOVE OUTLIER
Hongjun Su, Zhaoyue Wu and Pan Zheng

GPU IMPLENTATION OF RECURSIVE AUTOMATIC TARGET GENERATION PROCESS AND RECURSIVE ORTHOGONAL SUBSPACE PROJECTION IN HYPERSPECTRAL IMAGERY
Meiping Song, Dong An, Chunyan Yu, Jin Huang and Chein-I Chang

HYPERSPECTRAL TARGET DETECTION USING TREE-STRUCTURED PROBABILISTIC GRAPHICAL MODEL AND SEMI-PARAMETRIC DENSITY ESTIMATION
Assaf Dvora, Stanley Rotman and Mayer Aladjem

WEIGHTED KERNEL-BASED SIGNATURE SUBSPACE PROJECTION FOR HYPERSPECTRAL TARGET DETECTION
Mingyi He, Hanxue Mei, Yiming Wu and Hongmei Yan

A SPARSE SPATIAL-SPECTRAL HYPERSPECTRAL TARGET DETECTION ALGORITHM BASED ON CONDITIONAL RANDOM FIELD
Shaoyu Wang, Yanfei Zhong and Xinyu Wang

4-STAGE TARGET DETECTION APPROACH IN HYPERSPECTRAL IMAGES
Omer Ozdil, Ahmet Gunes, Yunus Emre Esin, Safak Ozturk and Berkan Demirel

A BAG-LEVEL DATA IMBALANCED MULTIPLE INSTANCE HYPERSPECTRAL TARGET REPRESENTATION
Jiaxin Shan, Zhiqiang Gong and Ping Zhong

Opening of the conference 8:00

Plenary 3 Near Infrared Spectral Imaging: from the macro- to the micro-scale and beyond 8:30 - 9:30

Aoife Gowen, *University College Dublin, Ireland*
Session chair : **Jocelyn Chanussot**, *Grenoble Institute of Technology, France*

Coffee break 9:30

tue-o-1-a Anomaly and Target Detection 10:00 - 12:00

Session chairs : **Tegan Emerson**, *Naval Research Lab., USA*
Robert Sundberg, *Spectral Sciences, Inc., USA*

THE IMPACT OF CLOUD SHADOWS ON SUBPIXEL TARGET DETECTION
Robert Sundberg

PATH-BASED BACKGROUND MODEL AUGMENTATION FOR HYPERSPECTRAL ANOMALY DETECTION
Tegan Emerson, Timothy Doster and Colin Olson

A NOVEL IMPLEMENTATION OF A HYPERSPECTRAL ANOMALY DETECTION ALGORITHM FOR REAL TIME APPLICATIONS WITH PUSHBROOM SENSORS
Pablo Horstrand, Sebastián López and José Fco. López

A MODIFIED MULTIPLE TARGETS DETECTION ALGORITHM FOR HYPERSPECTRAL IMAGERY
Yi Cen, Lifu Zhang and Xuejian Sun

HYPERSPECTRAL TARGET DETECTION BY USING SUPERPIXELS AND SIGNATURE BASED METHODS
Mustafa Kütük, Alper Koz and A. Aydın Alatan

A PARALLEL BP NEURAL NETWORK FOR SMALL TARGET DETECTION IN HYPERSPECTRAL IMAGE
Weitun Yang and Xiurui Geng

tue-o-1-b Precision Farming 10:00 - 12:00

Session chairs : **Konstantinos Karantzalos**, *Nat. Tech. Univ. of Athens, Greece*
Beril Sirmacek, *Create4D, The Netherlands*

DISCRIMINATION OF WHEAT VARIETIES IN THE FIELD BY HYPERSPECTRAL IMAGING ON CANOPIES.
Martin Ecarnot, Pierre Roumet and Frederic Compan

ANALYSIS OF SPECTRAL DATA CUBES FROM UAV BASED CAMERAS FOR PRECISION FARMING - AN AUTOMATED CROP MONITORING WORKFLOW FOR PLANT HEALTH INDICATION
Thomas Bahr and Nicolai Holzer

UAV-BASED HYPERSPECTRAL SENSING FOR YIELD PREDICTION IN WINTER BARLEY
Jan Oehlschläger, Urs Schmidhalter and Patrick Ole Noack

SEMI-AUTOMATED WORKFLOW FOR PROCESSING OF AIRBORNE HYPERSPECTRAL IMAGERY: CASE STUDY OF NITROGEN MAPPING IN AUSTRALIAN COTTON
Anastasiia Volkova, Jon Baird, Irah Wajchman and Julian Guinane

QUANTIFYING AND CORRECTING THE IMPACT OF VEGETATION COVER ON SOIL SPECTRAL FEATURES BASED ON SIMULATED CEREAL CANOPY REFLECTANCE SPECTRA
Theres Kuester, Sabine Chabrillat, Daniel Spengler, Kathrin Ward and Saskia Foerster

Lunch 12:00

tue-o-2-a Multimodality and Data Fusion 13:30 - 15:50

Session chairs : **Claas Grohnfeldt**, *DLR, Germany*
Wenzhi Liao, *Ghent University, Belgium*

HYPERSPECTRAL AND LIDAR INTENSITY DATA FUSION: A FRAMEWORK FOR THE RIGOROUS CORRECTION OF ILLUMINATION, ANISOTROPIC EFFECTS, AND CROSS CALIBRATION
Maximilian Brell, Karl Segl, Luis Guanter and Bodo Bookhagen

FUSION OF DATA SOURCES: THE EFFECT ON DIMENSIONALITY
Kerry Cawse-Nicholson, Charles Miller, Simon Hook and Glynn Hulley

CROSS-DOMAIN CLASSIFICATION FOR MULTI-SOURCE HYPERSPECTRAL IMAGES
Tianzhu Liu and Yanfeng Gu

FUSION OF HYPERSPECTRAL AND GROUND PENETRATING RADAR DATA TO ESTIMATE SOIL MOISTURE
Felix M. Riese and Sina Keller

APPLICATION OF PANSHARPENING ALGORITHMS FOR THE FUSION OF RAMAN AND CONVENTIONAL BRIGHTFIELD MICROSCOPY IMAGES
Christoph Pomrehn, Daniel Klein, Andreas Kolb, Peter Kaul and Rainer Herpers

MAPPER-REGULARIZED SEMI-SUPERVISED MANIFOLD ALIGNMENT FOR THE FUSION OF SIMULATED ENMAP IMAGE AND SENTINEL-1 DUAL-POL DATA
Jingliang Hu, Danfeng Hong and Xiao Xiang Zhu

BLIND IMAGE FUSION FOR HYPERSPECTRAL IMAGING WITH THE DIRECTIONAL TOTAL VARIATION
Leon Bungert, David A. Coomes, Matthias J. Ehrhardt, Jennifer Rasch, Rafael Reisenhofer and Carola-Bibiane Schönlieb

please notice end of session tue-o-2-a is 15:50

tue-o-2-b Hyperspectral Imaging from Small Platforms (1) 13:30 - 15:30

Session chairs : **Stefan Livens**, *VITO , Belgium*
Helge Aasen, *ETH Zurich, Switzerland*

CHIEM: A HYPERSPECTRAL IMAGE SENSOR FOR A MINIATURIZED EARTH OBSERVATION INSTRUMENT
Klaas Tack, Pilar Gonzalez, Nick Spooren, Andy Lambrechts, Joris Blommaert, Bavo Delaure, Stefan Livens and Dirk Nuyts

ONBOARD PROCESSING OF HYPERSPECTRAL DATA SETS ON A CUBESAT
Arnoud Jochemsen, Michael Soukup and Christina Aas

IMPLEMENTATION OF DEEP LEARNING IN SATELLITE IMAGERY FOR CROP IDENTIFICATION
Karthik Ravisankar, Venkatarangan Thirumalai, Baskaran Somasundaram and Thiruvadi Paul

DANGERS OF DEMOSAICING: CONFUSION FROM CORRELATION
Matti Eskelinen and Jyri Hämäläinen

COMPACT MULTISPECTRAL MULTI-CAMERA IMAGING SYSTEM FOR SMALL UAVS
Hans Erling Torkildsen, Trym Haavardsholm, Thomas Opsahl, Urmila Datta, Atle Skaugen and Torbjørn Skauli

LUNDE - A LIGHTWEIGHT PAYLOAD FOR HYPERSPECTRAL REMOTE SENSING USING SMALL UAVS
João Fortuna and Tor Arne Johansen

Coffee break 15:30

Lunch 12:00

tue-o-2-c Hyperspectral sensing: end to end (1) 13:30 - 15:30

Session chairs : **Simon Hook**, *Jet Propulsion Laboratory, NASA, USA*
Theres Küster, *GFZ, Potsdam, Germany*

OPTIMAL ESTIMATION FOR IMAGING SPECTROMETER ATMOSPHERIC CORRECTION
David Ray Thompson, Elizabeth Middleton, Vijay Natraj, Robert Green, Mark Helmlinger, Bo-Cai Gao and Michael Eastwood

3D AND SNAPSHOT HYPERSPECTRAL CAMERAS BASED ON CONTINUOUSLY VARIABLE FILTERS
Oliver Pust and Henrik Fabricius

A SPECTRAL IMAGING SYSTEM, INTEGRATING THERMAL, SWIR AND HYPERSPECTRAL SENSORS, FOR THE EFFICIENT MONITORING AND SURVEILLANCE OF WIDEZONES
Zacharias Kandylakis, Konstantinos Karantzalos, Lazaros Karagiannidis, Fay Misichroni and Angelos Amditis

QUANTITATIVE REMOTE SENSING AT ULTRA-HIGH RESOLUTION WITH UAV SPECTROSCOPY: A REVIEW OF SENSOR TECHNOLOGY, MEASUREMENT PROCEDURES, AND DATA CORRECTION WORKFLOWS
Helge Aasen, Eija Honkavaara, Arko Lucieer and Pablo J. Zarco-Tejada

Coffee break 15:30

tue-o-3-a Spectral Unmixing 16:00 - 18:00

Session chairs : **Miguel Velez-Reyes**, *The University of Texas at El Paso, USA*
Alp Ertürk, *Kocaeli University, Turkey*

SPECTRAL UNMIXING WITH MULTIPLE DICTIONARIES
Jérémy Cohen and Nicolas Gillis

ARCHETYPAL ANALYSIS FOR ENDMEMBER BUNDLE EXTRACTION CONSIDERING SPECTRAL VARIABILITY
Mingming Xu, Guangyu Zhang, Yanguo Fan, Bo Du and Liangpei Zhang

CONSTRAINT NON-NEGATIVE MATRIX FACTORIZATION WITH SPARSENESS AND PIECEWISE SMOOTHNESS FOR HYPERSPECTRAL UNMIXING
Xu Sun, Qian Peng, Bing Zhang, Lianru Gao and Lina Yang

A MULTIPLE ENDMEMBER MIXING MODEL TO HANDLE SPECTRAL VARIABILITY
Tatsumi Uezato, Mathieu Fauvel and Nicolas Dobigeon

REGIONAL VS. GLOBAL SUPERPIXEL-BASED UNMIXING OF HYPERSPECTRAL IMAGERY
Mohammed Alkhatib and Miguel Velez-Reyes

SPATIALLY ADAPTIVE HYPERSPECTRAL UNMIXING THROUGH ENDMEMBERS ANALYTICAL LOCALIZATION BASED ON SUMS OF ANISOTROPIC 2D GAUSSIANS
Fadi Kizel and Maxim Shoshany

tue-o-3-b Hyperspectral Imaging from Small Platforms (2) 16:00 - 18:00

Session chairs : **Helge Aasen**, *ETH Zurich, Switzerland*
Stefan Livens, *VITO , Belgium*

TOWARDS ATMOSPHERIC COMPENSATION AND RADIOMETRIC CORRECTION OF LOW ALTITUDE HIGH SPATIAL RESOLUTION RESOLUTION UAV BASED IMAGERY
Daniel Schläpfer, Christoph Popp and Rudolf Richter

AUTOMATED GEORECTIFICATION AND MOSAICKING OF UAV-BASED HYPERSPECTRAL IMAGERY
Yoseline Angel, Stephen Parkes, Darren Turner, Arko Lucieer and Matthew F. McCabe

ELOIS : A FREEFORM GRATING-BASED SPECTRO-IMAGER FOR SMALL PLATFORMS.
Vincent Moreau, Benoit Borguet and Jean-François Jamoye

CANONICAL CORRELATION AND OBJECT-BASED IMAGE ANALYSES FOR PHYSICAL SOIL PROPERTIES SPATIAL VARIABILITY CHARACTERIZATION USING DRONE-BASED HYPERSPECTRAL IMAGING
Hachem Agili, Karem Chokmani, Athyna Cambouris, Isabelle Perron and Jimmy Poulin

A COMPARISON OF UAS-BASED MULTISPECTRAL AND HYPERSPECTRAL SENSORS FOR SOIL ORGANIC CARBON PREDICTION IN CROPLANDS
Giacomo Crucil, Fabio Castaldi, Emilien Aldana-Jague, Bas Van Wesemael and Kristof Van Oost

tue-o-3-c Hyperspectral sensing: end to end (2) 16:00 - 18:00

Session chairs : **Rebecca Ilehag**, *Karlsruhe Institute of Technology, Germany*
Katarina Doctor, *Naval Research Laboratory, USA*

INFLUENCE OF SPECTRAL METRICS ON THE GRAPH-BASED SEGMENTATION OF HYPERSPECTRAL IMAGES
Kaouther Tabia, Xavier Desquesnes, Yves Lucas and Sylvie Treuillet

HYPERSPECTRAL REMOTE SENSING OF FIRE
Sander Veraverbeke, Philip Dennison, Ioannis Gitas, Glynn Hulley, Olga Kalashnikova, Thomas Katagis, Le Kuai, Ran Meng, Dar Roberts and Natasha Stravros

HYPERSPECTRAL IMAGING FOR ASSESSING THE QUALITY ATTRIBUTES OF CURED PORK LOIN
Andreas Kartakoullis, Andreas Kamilaris, Xavier Serra, Joel Gonzalez, Pere Gou and Maria Font

DETECTION OF PLANT RESPONSES TO DROUGHT USING CLOSE-RANGE HYPERSPECTRAL IMAGING IN A HIGH-THROUGHPUT PHENOTYPING PLATFORM
Mohd Shahrimie Mohd Asaari, Stien Mertens, Stijn Dhondt, Nathalie Wuyts and Paul Scheunders

DATA FUSION OF SPECTRAL AND VISIBLE IMAGES FOR RESOLUTION ENHANCEMENT OF FRACTION MAPS THROUGH NEURAL NETWORK AND SPATIAL STATISTICAL FEATURES
Fadi Kizel and Jon Atli Benediktsson

Overview

All day	**Poster sessions**				
		wed-p-1 **wed-p-3**	**Thermal and Infrared Sensing Applications**	**wed-p-2** **wed-p-4**	**Sensors / Missions** **Noise**
8:00	Opening				
8:30	**Oral Sessions**	**Room A**		**Room B**	
		wed-o-1-a	**Retrieval of Water Parameters**	**wed-o-1-b**	**Deep Learning (2)**
10:30	Coffee Break				
11:00	**Round table**				
12:00	Lunch				
13:30	**Oral Sessions**	**Room A**		**Room B**	
		wed-o-2-a	**Thermal and Infrared Sensing**	**wed-o-2-b**	**Multidate Sensing**
15:30	Coffee Break				
16:00	**Oral Sessions**	**Room A**		**Room B**	
		wed-o-3-a	**Classification**	**wed-o-3-b**	**Gas and Trace Gases**
18:00	End of the day				

wed-p-1 Thermal and Infrared Sensing

All day poster session

POLYNOMIAL-FITTING TEMPERATURE AND EMISSIVITY SEPARATION IN LWIR HYPERSPECTRAL IMAGERY
Matteo Moscadelli, Marco Diani, Giovanni Corsini, Aldo Riccobono and Antonio Porta

ANALYSES OF LAND SURFACE EMISSIVITY CHARACTERISTICS IN MID-INFRARED BANDS
Lei Yan, Shuaiyang Zhao, Hugh Mortimer and Xingbang Hu

AUTONOMOUS ATMOSPHERIC CORRECTION ALGORITHM FOR LONG WAVE INFRARED HYPERSPECTRAL IMAGERY
Pierre Lahaie

3D TERRAIN SEGMENTATION IN THE SWIR SPECTRUM
Dalton Rosario, Anthony Ortiz and Olac Fuentes

ATMOSPHERIC CORRECTION OF COMMERCIAL LWIR HYPERSPECTRAL IMAGERY USING FLAASH-IR AND NOISE SUPPRESSION
Steven Adler-Golden, Nevzat Guler and Timothy Perkins

THE RETRIEVAL OF AEROSOLS PROPERTIES USING THERMAL IMAGING SPECTROSCOPY AND SPECTROPOLARIMETRY
Michal Shimoni, Eldon Puckrin, Jason G. Zeibel and Robby Haelterman

wed-p-2 Sensors / missions

All day poster session

SPECTRAL REQUIREMENTS FOR THE DEVELOPMENT OF A NEW HYPER-SPECTRAL RADIOMETER INTEGRATED IN AUTOMATED NETWORKS - THE HYPERNETS SENSOR
Clemence Goyens, Kevin Ruddick and Joel Kuusk

COMPARING HYPERSPECTRAL IMAGING CONCEPTS USING KEY PROPERTIES
Stefan Livens

KEY QUALITY PARAMETERS IN HYPERSPECTRAL CAMERAS: THE KEYSTONE EFFECT AND ITS INFLUENCE ON PROCESSING RESULTS
Trond Løke, Julio Hernandez, Ivar Baarstad, Andrei Fridman, Pesal Koirala and Hallvard Skjerping

PROBA-1: STATUS UPDATE AND UPCOMING STEPS
Giuseppe Ottavianelli, Frederic Teston, Roberto Biasutti, Bruno Schmitt, Etienne Tilmans, Tim Pearson, Rita Malosti, Sam Lavender, Mike Cutter and Stefano Santandrea

THE COPERNICUS HYPERSPECTRAL IMAGING MISSION FOR THE ENVIRONMENT (CHIME) PHASE A/B1: TOWARDS A COPERNICUS HYPERSPECTRAL MISSION.
Nicolas Lamquin, Nick Cox, Adrien Grynagier, Dimitri Lebedeff, Odile Fanton d'Andon, Antoine Mangin, Frédéric Rouffi, Gilbert Barrot and Sébastien Clerc

SUBBAND CAMERA CALIBRATION OF A LOW-RESOLUTION HYPERSPECTRAL FULL-FRAME CAMERA
Rebecca Ilehag and Andreas Schenk

wed-p-3 Applications

All day poster session

HELIPORT DETECTION IN HIGH-RESOLUTION OPTICAL REMOTE SENSING IMAGES
Emre Başeski

REPRESENTING THE SPECTRAL BRDF WITH SPHERICAL HARMONICS
Katarina Doctor and Jeff Byers

A NEW APPROACH DEVELOPED TO STUDY VARIABILITY IN NORTH AFRICAN DUST TRANSPORT ROUTES OVER THE ATLANTIC DURING 2001–2015
Ling Meng and Huiwang Gao

RETRIEVAL OF ATMOSPHERIC PARAMETERS AND LAND SURFACE REFLECTANCE FROM AIRBORNE HYPERSPECTRAL DATA
Ning Wang, Yaokai Liu, Qian Yonggang, Lingling Ma, Chuanrong Li and Lingli Tang

CHARACTERIZATION OF THE FLUORESCENCE PEAK ON REMOTE SENSING REFLECTANCE FOR DIFFERENT CONDITIONS OF LAKE GARDA
Ilaria Cesana, Mariano Bresciani, Sergio Cogliati, Roberto Colombo and Claudia Giardino

DETECTION OF FERTILIZER QUANTITY IN SOIL USING HYPERSPECTRAL DATA
Jay Prakash Kumar, Shailesh Deshpande and Arun Inamdar

EXPLORING CHEMICAL IMAGING DATA SETS WITH TOPOLOGICAL DATA ANALYSIS
Ludovic Duponchel

SPECTROSCOPIC DECOMPOSITION OF ASTRONOMICAL MULTISPECTRAL IMAGES USING B-SPLINES
Hassan Mortada, Vincent Mazet, Charles Soussen and Christophe Collet

ALG: A TOOLBOX FOR THE GENERATION OF LOOK-UP TABLES BASED ON ATMOSPHERIC RADIATIVE TRANSFER MODELS
Jorge Vicent, Neus Sabater, Luis Alonso, Jochem Verrelst and José Moreno

A SURVEY FOR STUDY OF FEATURE SELECTION BASED ON MUTUAL INFORMATION
Amber Su and Fang Liu

CLASSIFICATION OF INTERTIDAL SEDIMENTS USING AN AIR-BORNE HYPERSPECTRAL IMAGES: A CASE STUDY IN THE GARORIM BAY, WEST COAST OF KOREAN PENINSULAR
Wook Park, Yoon-Kyung Lee, Bo-Ram Lee, Joo-Hyung Ryu and Joong-Sun Won

SUBSURFACE PEANUT PARTICLE DETECTION USING SPATIALLY RESOLVED SPECTROSCOPY
Antoine Laborde, Ryad Bendoula, Daphné Heran, Anthony Boulanger, Jean Michel Roger, Benoit Jaillais and Christophe Cordella

wed-p-4 Noise

All day poster session

MODIFIED RESIDUAL METHOD FOR ESTIMATION OF SIGNAL DEPENDENT NOISE IN HYPERSPECTRAL IMAGES
Asad Mahmood, Amandine Robin and Michael Sears

STATISTICAL NOISE REMOVAL (SNR) – A NOVEL APPROACH OF REMOVING NOISE FROM THE FULL RANGE FIELD COLLECTED SPECTRA
Salghuna N N, Rama Chandra Prasad P and Rama Rao N

CLOUD REMOVAL BASED ON NOISE-ADJUSTED PRINCIPAL COMPONENTS TRANSFORM
Meng Xu, Sen Jia, Xiuping Jia and Mark Pickering

NORMALIZED MATCHED FILTER WEIGHT METHOD: AN AUTOMATIC BAD BAND PRE-REMOVAL ALGORITHM FOR HYPERSPECTRAL IMAGERY
Luyan Ji and Xiurui Geng

EFFECT OF SPATIAL COREGISTRATION ERROR ON THE DIMENSIONALITY OF HYPERSPECTRAL IMAGE DATA
Torbjorn Skauli, Sindre Løining Skaar and Hans Erling Torkildsen

LABEL NOISE ROBUST CLASSIFICATION OF HYPERSPECTRAL DATA
Alina E. Maas, Behnood Rasti and Magnus Orn Ulfarsson

Opening of the conference 8:00

wed-o-1-a Retrieval of Water Parameters 8:30 - 10:30

Session chairs : **Ivar Erdal**, *Ecotone, Norway*
Mireille Guillaume, *Inst. Fresnel, Marseille, France*

WATERHYPERNET - A NETWORK OF HYPERSPECTRAL RADIOMETERS FOR MULTI-SATELLITE WATER REFLECTANCE VALIDATION
Kevin Ruddick, Dieter Vansteenwegen, Matthew Beck, David Doxaran, Ana Dogliotti, Fang Shen, Dimitry Van der Zande, Thanos Gkritzalis and André Cattrijsse

PROCESSING OF CHRIS-PROBA HYPERSPECTRAL IMAGES TO RETRIEVE WATER QUALITY INFORMATION
Heloise Lavigne, Quinten Vanhellemont and Kevin Ruddick

EFFECT OF INCLUSION OF NEW VARIABLES IN INVERSION OF SEMI – ANALYTICAL MODEL FOR SYNTHETIC HYPERSPECTRAL DATA OF SHALLOW WATERS
Srinivas Kolluru, Shirishkumar S Gedam and Inamdar A B

MACHINE LEARNING REGRESSION ON HYPERSPECTRAL DATA TO ESTIMATE MULTIPLE WATER PARAMETERS
Philipp M. Maier and Sina Keller

NMF HYPERSPECTRAL UNMIXING OF THE SEA BOTTOM: INFLUENCE OF THE ADJACENCY EFFECTS, MODEL AND METHOD
Mireille Guillaume, Louis Juste, Xavier Lenot, Yannick Deville, Bruno Lafrance, Malik Chami, Sylvain Jay, Audrey Minghelli, Xavier Briottet and Veronique Serfaty

wed-o-1-b Deep Learning (2) 8:30 - 10:30

Session chairs : **Yanfeng Xu**, *Harbin Insitute of Technology, China*
Yang Xu, *Nanjing Univ. of Science and Technology, China*

DIMENSIONALITY-VARIED CONVOLUTIONAL NEURAL NETWORK FOR HYPERSPECTRAL IMAGE CLASSIFICATION WITH SMALL-SIZED LABELED SAMPLES
Xuejian Liang, Wanjun Liu, Ye Zhang and Jie Yu

HYPERSPECTRAL IMAGE CLASSIFICATION VIA SAMPLE EXPANSION FOR CONVOLUTIONAL NEURAL NETWORK
Jiaojiao Li, Qian Du, Bobo Xi and Yunsong Li

A DIVERSIFIED DEEP ENSEMBLE FOR HYPERSPECTRAL IMAGE CLASSIFICATION
Zhiqiang Gong, Ping Zhong, Jiaxin Shan and Weidong Hu

TRIPLET CONSTRAINED DEEP FEATURE EXTRACTION FOR HYPERSPECTRAL IMAGE CLASSIFICATION
Fahim Alam, Jun Zhou, Alan Wee-Chung Liew, Jun Jo and Yongsheng Gao

TRANSFERING SUPER RESOLUTION CONVOLUTIONAL NEURAL NETWORK FOR REMOTE SENSING DATA SHARPENING
Meziane Iftene, Mohammed El Amin Arabi and Moussa Sofiane Karoui

Coffee break 10:30

Round Table 11:00 - 12:00

Lunch 12:00

wed-o-2-a Thermal and Infrared Sensing 13:30 - 15:50

Session chairs : **Michal Shimoni**, *Royal Military Academy, Brussels, Belgium*
Pierre Lahaie, *Defence Research and Development Canada*

A TEMPERATURE AND EMISSIVITY RETRIEVAL ALGORITHM FROM HYPERSPECTRAL THERMAL INFRARED DATA
Qian Yonggang, Ning Wang, Lingling Ma, Chuanrong Li, Lingli Tang, Li Kun and Liu Yaokai

CONNECTING INFRARED SPECTRA WITH PLANT TRAITS TO IDENTIFY SPECIES
Maria Fernanda Buitrago, Andrew Skidmore, Thomas Groen and Christoph Hecker

A NOVEL SCENE-BASED NON-UNIFORMITY CORRECTION METHOD FOR SWIR PUSH-BROOM HYPERSPECTRAL SENSORS
Bin-Lin Hu, Shi-Jing Hao, De-Xin Sun and Yin-Nian Liu

HYTES, ECOSTRESS AND HYSPIRI – IMAGING IN THE THERMAL INFRARED
Simon Hook, Glynn Hulley and Kerry Cawse-Nicholson

DICTIONARY BASED TEMPERATURE AND EMISSIVITY SEPARATION ALGORITHM IN LWIR HYPERSPECTRAL DATA
Nicola Acito, Marco Diani and Giovanni Corsini

PREDICTION OF SOIL LEAD CONTENT USING VISIBLE AND NEAR-INFRARED SPECTROSCOPY
Xia Zhang, Weichao Sun, Wenchao Qi and Xing Wu

AUTOMATIC DETECTION OF SURFACE DAMAGES ON STEEL STRUCTURE USING NEAR INFRARED HYPERSPECTRAL IMAGING
Zohreh Zahiri, Bart Ribbens, Steve Vanlanduit and Paul Scheunders

please notice end of session wed-o-2-a is 15:50

wed-o-2-b Multidate Sensing 13:30 - 15:30

Session chairs : **Sebastian Lopez**, *Univ. de Las Palmas de Gran Canaria, Spain*
Pedram Ghamisi, *HZDR, Germany*

UNMIXING BASED CHANGE DETECTION FOR HYPERSPECTRAL IMAGES WITH ENDMEMBER VARIABILITY
Alp Ertürk

CHANGE DETECTION FOR HYPERSPECTRAL IMAGES USING EXTENDED MUTUAL INFORMATION AND OVERSEGMENTATION
Bahar Taskesen, Alper Koz, Abdullah Aydin Alatan and Oliver Weatherbee

MULTI-TEMPORAL HIGH-RESOLUTION IMAGING SPECTROSCOPY WITH HYPERSPECTRAL 2D IMAGERS – FROM THEORY TO APPLICATION
Helge Aasen and Andreas Bolten

INVERTING PROCOSINE-D FOR VERY HIGH SPATIAL AND TEMPORAL RESOLUTION RETRIEVAL OF FOLIAR BIOCHEMISTRY
Henning Buddenbaum

A PROBABILISTIC FRAMEWORK FOR FUSING CLASSIFICATIONS DERIVED FROM MULTI-TEMPORAL HYPERSPECTRAL IMAGERY
Sven Schneider, Richard J. Murphy and Arman Melkumyan

CLOSE RANGE METHODS TO MONITOR VEGETATION DYNAMICS ON A DRY ALPINE MOUNTAIN GRASSLAND OVER DIFFERENT SPATIAL AND TEMPORAL SCALES
Abraham Mejia-Aguilar, Mattia Rossi, Georg Niedrist, Giustino Tonon, Sarah Asam, Marc Zebisch and Claudia Notarnicola

Coffee break 15:30

wed-o-3-a Classification 16:00 - 18:00

Session chairs : **Qian Du**, *Mississippi State University, USA*
Shailesh Deshpande, *Tata Consultancy Services Ltd, India*

A SPECTRAL–SPATIAL INFORMATION INTEGRATED-KERNEL MINIMUM NOISE FRACTION TRANSFORMATION FOR HYPERSPECTRAL IMAGE CLASSIFICATION
Bin Zhao, Lianru Gao and Bing Zhang

HYPERSPECTRAL IMAGE CLASSIFICATION BASED ON EXTENDED MORPHOLOGICAL ATTRIBUTE PROFILES AND ABUNDANCE INFORMATION
Xia Zhang, Yanli Sun and Wenchao Qi

KERNEL SPATIAL-SPECTRAL BASED MULTI-VIEW LOW-RANK SPARSE SUBSPACE CLUSTERING FOR HYPERSPECTRAL IMAGERY
Long Tian, Qian Du, Ivica Kopriva and Nicolas Younan

ORTHOGONAL POLYNOMIAL FUNCTION FITTING FOR HYPERSPECTRAL DATA REPRESENTATION AND DISCRIMINATION
Liwei Li, Bing Zhang and Lianru Gao

A NOVEL DERIVATIVE-BASED CLASSIFICATION METHOD FOR HYPERSPECTRAL DATA PROCESSING
Yücel Çimtay and Hakkı Gökhan İlk

wed-o-3-b Gas and Trace Gases 16:00 - 18:00

Session chairs : **Glynn Hulley**, *Jet Propulsion Laboratory, NASA, USA*
Safak Ozturk, *Havelsan, Turkey*

HIGH SPATIAL RESOLUTION IMAGING OF METHANE AND OTHER TRACE GASES WITH THE AIRBORNE HYPERSPECTRAL THERMAL EMISSION SPECTROMETER (HYTES)
Glynn Hulley

GAS PLUME DETECTION IN HYPERSPECTRAL VIDEO SEQUENCE USING TENSOR NUCLEAR NORM
Wenting Shang, Zebin Wu, Jie Wei, Yang Xu, Ling Qian, Zhihui Wei, Jocelyn Chanussot and Andrea Bertozzi

A NOVEL HIGHLY PARALLEL ALGORITHM FOR THE DETECTION AND TRACKING OF CHEMICAL GAS PLUMES USING HYPERSPECTRAL VIDEO SEQUENCES
Maria Diaz, Jocelyn Chanussot, Raul Guerra, SebastiÁn LÓpez, Roberto Sarmiento and Andrea L. Bertozzi

IMPORTANCE OF BAND SELECTION FOR ETHENE AND METHANOL GAS DETECTION IN HYPERSPECTRAL IMAGERY
Safak Ozturk, Yunus Emre Esin, Yusuf Artan, Omer Ozdil and Berkan Demirel

A NOVEL 2-STAGE APPROACH FOR CO2 GAS DETECTION USING HYPERSPECTRAL IMAGERY
Safak Ozturk, Yusuf Artan, Yunus Emre Esin and Omer Ozdil

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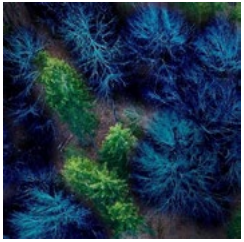

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- High light throughput – low Signal-to-NoiseFull
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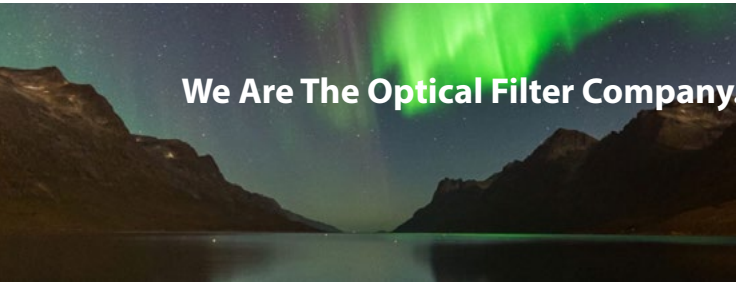

Delta Optical Thin Film designs, manufactures, tests and supplies world class leading optical thin film filters and components. Our products are used in a variety of applications within the medical, bioscience, imaging, sensor, analytical and similar industries and are designed and manufactured according to ISO 9001 and ISO 1400 standards.

High quality products are the keystone of Delta Optical Thin Film's success. Our quality management system ensures control and documentation of processes and products throughout the whole design and production process.

Located in Hørsholm, Denmark, Delta Optical Thin Film has since the 1960s been the pioneer in computer designed optical coatings.

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Our development team is able to make extremely precise predictions of, for example, phase retardation, and uses other dedicated techniques, helping the world's leading manufacturers of analytical and biomedical instruments make unique instruments.

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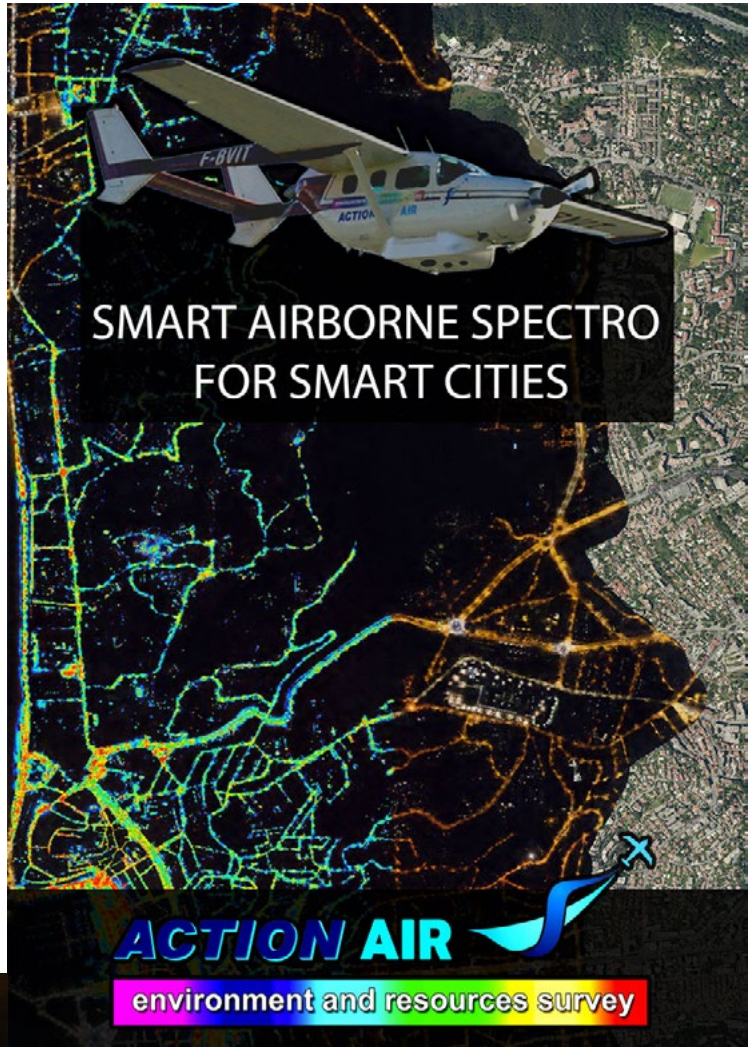

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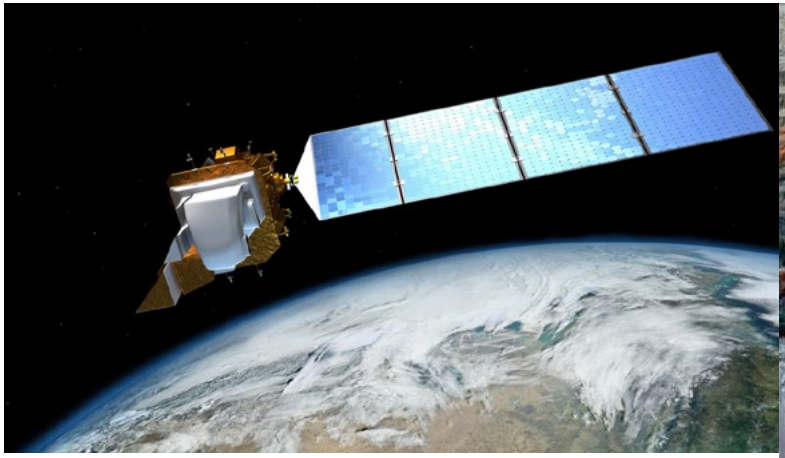

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